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EOSDIS Core System Project

Interface Control Document Between the EOSDIS Mission Operations Segment (EMOS) and the Science Data Processing Segment (SDPS) for the ECS Project

March 2000

Raytheon Systems Company
Upper Marlboro, Maryland

Interface Control Document Between the ECS Mission Operations Segment (EMOS) and the Science Data Processing Segment (SDPS) for the ECS Project

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Preface

This document is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to final contract acceptance. This document is under ECS contractor configuration control. Contractor approved changes are handled in accordance with the change control requirements described in the EOS Configuration Management Plan. Changes to this document will be made by document change notice (DCN) or by complete revision.

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Abstract

This document covers the interface mechanisms employed for transfer of three categories of data from ECS EMOS to ECS SDPS; namely, EMOS Terra Detailed Activity Schedules (DAS), EMOS Terra and Aqua History Data and EMOS Aqua Carry-out Files. It also contains other information essential for successful implementation of the interfaces.

Keywords: Carry-out files, Detailed Activity Schedule, DADS, DAS, EMOS, FTP, GBAD, History, Ingest, SDPS, SIPS

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Document Number	**Status/Issue**	**Publication Date**	**CCR Number**
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Abbreviations and Acronyms

1. Introduction

1.1 Identification

This Interface Control Document (ICD), Contract Data Requirements List (CDRL) item 029 whose requirements are specified in Data Item Description (DID) 209/SE1, is a required deliverable under the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) Contract (NAS5-60000).

1.2 Scope

The scope of this document is determined by requirement DADS0160 in the Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System Core System. That requirement specifies that the SDPS will archive EMOS History Data and Activity Schedules. This document covers the interface mechanisms employed for transfer of those two categories of data, as well as Aqua Carry-out Files, from EMOS to SDPS and contains other information essential for successful implementation of the interfaces.

1.3 Purpose

This document is written to formalize the interpretation and general understanding of the interfaces between ECS SDPS and the EMOS in general. This document provides clarification and elaboration of those interfaces to the extent necessary to assure hardware, software, and operational service compatibility within the end-to-end system.

This document provides a point of mutual control of external interface definitions via the ESDIS Configuration Control Board (CCB).

1.4 Status and Schedule

This is the ICD for the Terra and Aqua interfaces between EMOS and ECS SDPS. This document contains interface specifications for all data transfer from EMOS to ECS SDPS. If new EMOS-SDPS- interfaces are added, they will be documented in this ICD.

This ICD has been submitted as an ECS Project CCB approval Code 1 document. At the Government's option, this document may be designated to be under full Government CCB control. Changes may be submitted for consideration by Contractor and Government CCBs under the normal change process at any time.

Within this document may be some TBRs, TBSs and/or TBDs. A Work-off Plan is provided as Appendix A. The work-off plan provides the following information:

a. ICD I/F Issue No.

b. ICD Reference Paragraph

c. ICD Issue Priority

d. ICD Issue Type - Description

e. Work-off Plan Task(s)

f. Projected Resolution Date

g. Risk Assessment

1.5 Organization

Section 1 provides information regarding the identification, scope, purpose and objectives, and organization of this document.

Section 2 lists parent documents and related documents that were used as sources of information for this document or that provide additional background information to aid understanding of the interface implementations.

Section 3 is an overview of the interfaces for data exchange between the SDPS and EMOS.

Section 4 contains, context, interface mechanism, data flow and error recovery information for Detailed Activity Schedule file transfer.

Section 5 contains context, interface mechanism, data flow, and error recovery information for EMOS history file and carry-out file transfer.

Appendix A contains a Work-off Plan for all TBRs, TBSs and/or TBDs for data exchange mechanisms.

A list of abbreviations and acronyms is also provided.

2. Related Documentation

The latest versions of all documents below should be used. The latest ESDIS Project documents can be obtained from URL: http://spsosun.gsfc.nasa.gov/ESDIS_Pub.html. ESDIS documents have a document number starting with either 423 or 505. The latest EOSDIS Core System (ECS) documents can be obtained from URL http://edhs1.gsfc.nasa.gov/ .

2.1 Parent Documents

423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS)

2.2 Applicable Documents

The following documents are referenced within this ICD, or are directly applicable, or contain policies or other directive matters that are binding upon the content of this ICD.

193-208-SE1	Methodology for Definition of External Interfaces for the ECS Project
209-CD-034	Data Format Control Document for EMOS to ICC Planning and Scheduling Files for the ECS Project – To be published
305-CD-500	Release 5A Segment/Design Specification for the ECS Project
423-41-57	Interface Control Document Between the EOSDIS Core System (ECS) and the Science Investigator-Led Processing System (SIPS), Volume 0, Interface Mechanisms

2.3 Information Documents

2.3.1 Information Documents Referenced

The following documents are referenced herein and, amplify or clarify the information presented in this document. These documents are not binding on the content of this ICD.

RFC 0959	Postel, J. & J.K. Reynolds, File Transfer Protocol, Oct-01-1985, (Status: STANDARD)

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3. Overview

3.1 Interface Overview

This ICD covers two separate EMOS to SDPS interfaces, one to ingest EMOS Terra detailed activity schedules into the ECS SDPS at the LaRC DAAC and one to ingest EMOS history files and Carry-out files into the ECS SDPS at the GSFC DAAC.

3.2 Detailed Activity Schedule (DAS)

The DAS provides a conflict-free schedule that is used by the EOS Operations Center (EOC) to generate Terra stored command loads and ground script. It contains activities for all Terra subsystems and instruments, including TDRSS contact activities.

The EMOS Mission Management System (MMS) generates and updates Detailed Activity Schedules for the Terra mission and automatically sends each schedule file to the ECS ICCs and designated science processing locations. EMOS immediately ftp's each Detailed Activity Schedule generated to a staging server at the LaRC DAAC, from which it is retrieved and ingested into the ECS archives at LaRC.

The ECS Planning and Data Processing Subsystem (PDPS) software pulls DAS files as needed from the LaRC DAAC archives to plan and schedule MISR data processing.

3.3 EMOS History Data and Carry-out Files

EMOS history data comprises six data types as follows:

- Analysis Statistics: The analysis statistics are the trending and system state files associated with the EMOS Analysis system. These files are separate from the Analysis General archive for quick turn-around and recovery from the DAAC.
- Raw Production Data Sets: These are the Level 0 processing output from the EDOS facility of the spacecraft data. It is composed of high rate and real-time spacecraft data
- EMOS Online General Archive: All the files associated with the Online system, including the real-time log, command data blocks sent to EDOS , memory dumps and loads.
- EMOS Mission Management System General Archive: Contains all the reports, dumps, loads and Flight Dynamic Facility files from the MMS component of EMOS.
- EMOS Analysis General Archive: Contains all converted PDS data (aka PDS DMFs). Converted PDS data is a combination of Rate Buffered and operational data and is used as input into the Analysis ABE and file generation tools.

- Ground Telemetry: Composed of the NCC and CODA messages archive. The NCC messages contain performance and configuration data about the TDRS links to the spacecraft. The CODA messages are additional accounting information regarding all links to the spacecraft from EDOS.

There are two data types for EMOS Aqua carry-out files, as follows:

- Aqua Carryout Housekeeping – Each file contains all Aqua Housekeeping parameters for a two hour period. One Carryout file will be created by the Analysis system for each EPDS made by BOX. This amounts to a total of 12 files delivered to the DAAC daily. These files may be used in PGE processing.
- Aqua Carryout GBAD – Each file contains all Ground Based Attitude Determination Data for a two hour period. One Carryout file will be created by the Analysis system for each EPDS made by BOX. This amounts to a total of 12 files delivered to the DAAC daily After DPREP formatting, these file are used in processing by the PGEs.

The history data and carry-out files are provided regularly to ECS SDPS at the GSFC DAAC for ingest into the ECS archives there. EMOS can order these files using the EOS Data Gateway (EDG) client or the SIPS Machine-to-Machine Gateway (TBD).

4. Detailed Activity Schedules

4.1 Network Context

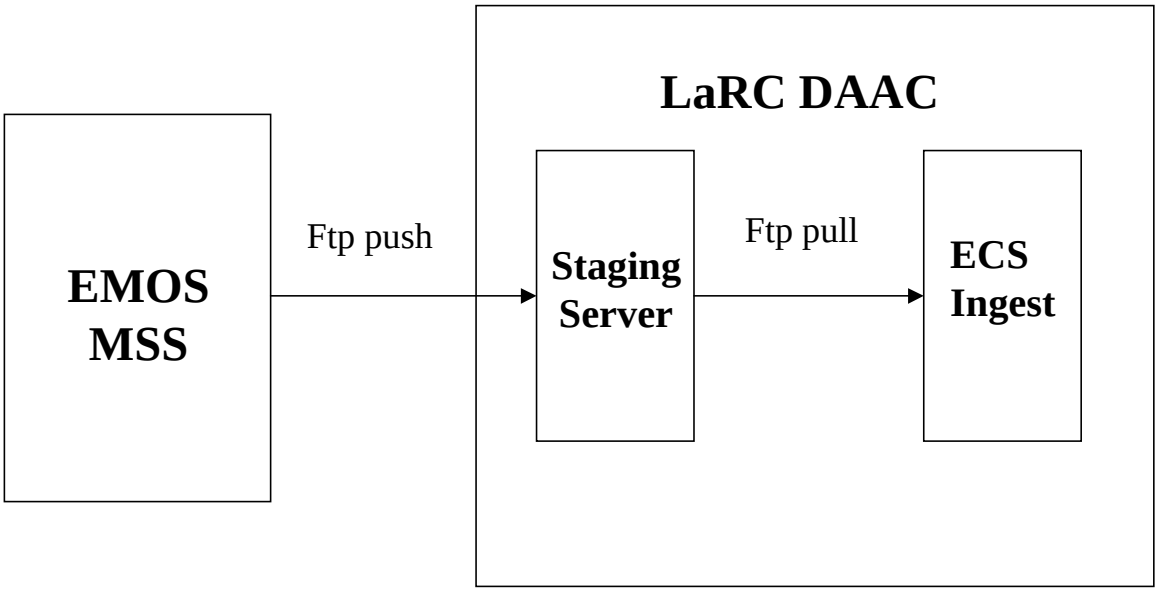

Figure 4-1. EMOS-SDPS Polling Interface at LaRC DAAC, Context Diagram

As diagrammed in Figure 4-1, EMOS pushes Terra DAS files to a staging server at the LaRC DAAC, from which SDPS Ingest retrieves the files.

4.2 Polling Without Delivery Record Interface

The EMOS provides the data specified in Section 4.3 to the SDPS at the following location, which will be designated herein as the staging server, at the LaRC DAAC.

Host: lvicgaa.larcb.ecs.nasa.gov

Directory: /usr/ecs/OPS/CUSTOM/icl/a/data/pEMOS

Whenever a new DAS file is created, the EMOS MMS uses a controlled account and password to open an ftp session to that directory. The account and password required to gain access to the staging server are documented in an operations agreement between EMOS and the LaRC DAAC.

The EMOS MMS automatically pushes the DAS file to that staging server using the ftp *put* command. The file transfer uses the image (binary) type representation. In order to prevent ingest of partial files into the SDPS, during transfer the MMS inserts a leading dot in the file name, rendering the file invisible to the SDPS Ingest polling software. Once the MMS completes

transfer of the DAS file it renames the file by removing the leading dot, making the file visible to the SDPS Ingest software.

If the transmission of any file is unsuccessful, the ftp put command is repeated up to an operator tunable number of times. When the file has been successfully transmitted to the staging server and renamed, the MMS closes the ftp session. This process is repeated each time a DAS file is created or updated.

Only DAS files may be placed in the designated staging server directory. SDPS ingests all files found in that directory.

With operator-tunable periodicity, the SDPS Ingest software polls the designated staging server directory. Whenever it detects a new file, SDPS pulls this file via FTP, and ingests and archives it. SDPS is responsible for periodically cleaning the staging server directory.

The File Transfer Protocol (ftp) used by ECS SDPS to retrieve the DAS files is defined in RFC 959.

All DAS files are transferred in clear text.

The identifier for this polling without delivery record interface in the SDPS Ingest database is "EMOS."

Operator-configurable parameters such as number of retries, polling intervals, host and directory names should be specified in an operations agreement between EMOS and the LaRC DAAC.

4.3 Data Flows

The Terra DAS data consists of a single ECS Earth Science Data Type having the ESDT shortname ActSched. Maximum file size is 2GB. A unique filename is assigned to each new or updated DAS file by EMOS. The file name of the DAS file and format of the DAS header and the DAS file as well as timelines for creating and updating the DAS are documented in the Data Format Control Document for EMOS to ICC Planning and Scheduling Files for the ECS Project.

Nominally, two DAS files per day are expected to be received and archived. However, there is no firm schedule for DAS file delivery and the SDPS polling interval must be chosen to archive all DAS deliveries within a timeframe that will adequately support MISR processing at the DAAC.

4.4 DAS Metadata

The Ingest subsystem reads the DAS file header and extracts the following three fields to be stored as metadata attributes: Message ID, Schedule Start Time and Schedule Stop Time. These three fields are required for the PDPS software to definitively identify the latest update to any DAS.

4.5 Error Recovery

RFC 959 defines ftp error handling features.

5. EMOS History Data and Carry-out Files

5.1 Network Context

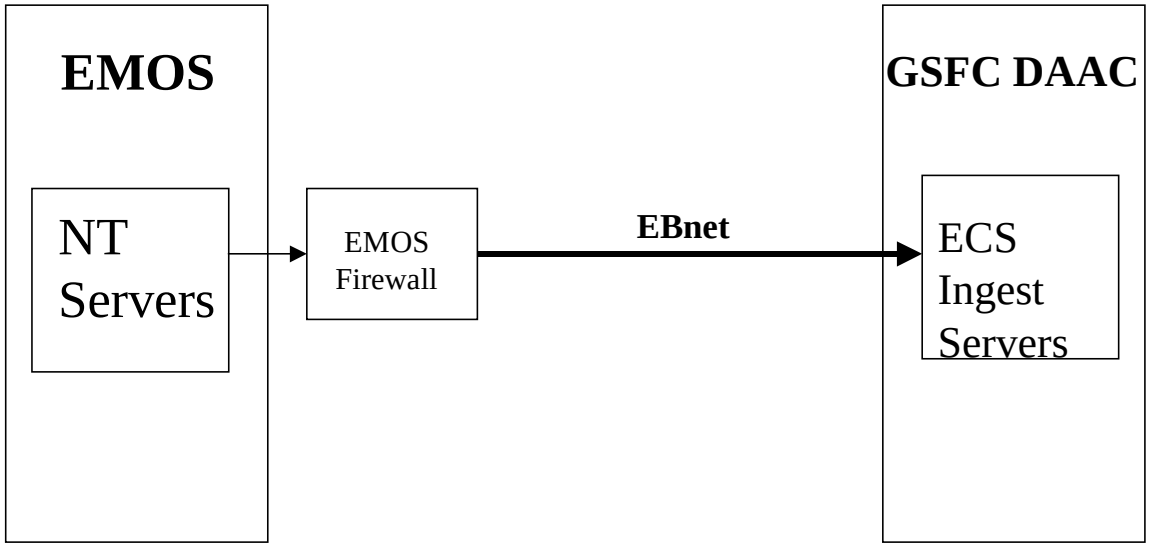

Figure 5-1. EMOS-SDPS SIPS Interface at GSFC DAAC, Network Context

The ECS-SIPS interface methodology is used for delivery of EMOS historical data and carry-out files (see Section 5.2). The interface context is shown in Figure 5-1. EMOS ftp pushes the data files listed in Section 5.3 with their associated metadata (.met) files and the product delivery record (PDR) file directly to a specified directory on an ECS Ingest server at the GSFC DAAC via EBnet. ECS SDPS returns PDRD and PAN files to EMOS via FTP. Polling intervals, host, path and directory names, e-mail addresses and operator contact information are specified in an operations agreement between EMOS and the GSFC DAAC.

The GSFC DAAC is responsible for cleaning the directory of PDR and other files that have been dispositioned.

The details of this interface with sequencing and specifications for the handshaking messages and error recovery information are given in Section 4.5 of the ECS-SIPS ICD, Volume 0.

5.2 SIPS Interface

EMOS History Data and Carry-out files are transferred to the ECS SDPS and ingested at the GSFC DAAC using the standard ECS-SIPS interface, documented in Section 4.5 of the ICD Between the ECS and the Science Investigator-Led Processing Systems, Volume 0, Interface Mechanisms (ECS-SIPS ICD). EMOS first places the data and metadata files and then a Product

Delivery Record (PDR) on the designated server. ECS SDPS at GSFC DAAC polls the designated directory to retrieve new PDRs, evaluates the PDR for internal consistency and conformance to the ICD, and sends a Product Delivery Record Discrepancy message (PDRD) if the PDR is errored. If the PDR is not errored, SDPS picks up the files and processes them. It then sends a Product Acceptance Notice notifying EMOS of successful ingest and/or of any errors encountered during processing.

The value of ORIGINATING_SYSTEM on the PDR for this interface is EMOS_HIST .

5.3 Data Flows

ESDT Shortname	ESDT Longname	No. of files	Frequency, files per day	File Size (MB)
AMSTAT	AM Analysis Statistics	3	1	51
AMPDS	AM Raw Production Data Sets	12	1	144
GND_TLM	Ground Telemetry	50	1	10
AMONLARC	AM EMOS Online General Archive	50	1	215
AMMMSARC	AM EMOS MMS General Archive	75	1	5
AMANAARC	AM EMOS Analysis General Archive	24	1	5000
PMSTAT	PM Analysis Statistics	TBD	TBD	TBD
PMPDS	PM Raw Production Data Sets	TBD	TBD	TBD
PMONLARC	PM EMOS Online General Archive	TBD	TBD	TBD

ESDT Shortname	ESDT Longname	No. of files	Frequency, files per day	File Size (MB)
PMMMSARC	PM EMOS MMS General Archive	TBD	TBD	TBD
PMANAARC	PM EMOS Analysis General Archive	TBD	TBD	TBD
PMCO_HK	Aqua Carryout Housekeeping	1	12	TBD
PMCOGBAD	Aqua Carryout Ground Based-Attitude Determination Data	1	12	TBD

EMOS will use unique filenames to ensure that files pushed to the ECS directory will not be overwritten and that ECS Ingest can identify which files have not been ingested.

5.4 Error Recovery

See ECS-SIPS ICD, Volume 0, Section 4.5.

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Appendix A. Issues Work-Off Plan

ICD Issue #	ICD Para. #	Issue Priority	ICD Issue Type & Description	Work-off Plan Task(s)	Projected Resolution Date	Risk Assessment**
1	Sec. 5.3	A	Carry-out and Aqua history file volumes needed	Provide estimates of carry-out file volumes to ECS Systems Engineering	April 00	Capacity of PDR server on Ingest server adequate for history files. Carry-out file volumes must be furnished to confirm PDR server location for Aqua files. Aqua history file volumes must be furnished to confirm PDR server location for Aqua files.

Issue Priority Categories:

A = Design impact; e.g., an unresolved interface.

B = Minimal design impact; e.g., content or format of a specific field unresolved.

C = No design impact - administrative detail; e.g., reference document number is not available.

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Abbreviations and Acronyms

ASTER	Advanced Spaceborne Thermal Emission and Reflection (Radiometer)
ATC	Absolute Time Command
DAS	Detailed Activity Schedule
DFCB	Data Format Control Book
ECS	EOSDIS Core System
EOC	EOS Operations Center
EMOS	ECS Mission Operations Segment
ESDIS	Earth Science Data and Information System
FDS	Flight Dynamics System
FOT	Flight Operations Team
FTP	File Transfer Protocol
ICC	Instrument Control Center
IOT	Instrument Operations Team
IST	Instrument Support Terminal
LG	Load Generation
MISR	Multi-angle Imaging SpectroRadiometer
MMS	Terra/AM-1 Mission Management System
PAN	Product Acceptance Notice
PDPS	Planning and Data Processing Subsystem
PDR	Product Delivery Record
PDRD	Product Delivery Record Discrepancy
SCC	Spacecraft Command Computer
SDPS	Science Data Processing Segment
SIPS	Science Investigator-Led Processing System
TDRSS	Tracking and Data Relay Satellite System

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